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The American Biology Teacher

VOL. 3 APRIL, 1941 NO. 7

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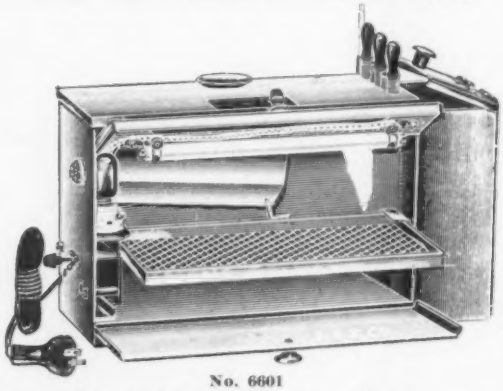

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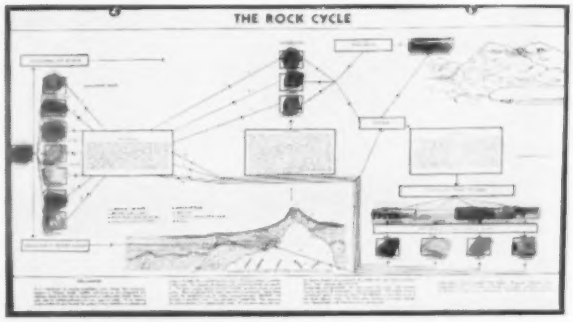

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The American Biology Teacher

Vol. 3 APRIL, 1941 No. 7

A Summary of Part of the Questionnaire Sent to Teachers of Biological Sciences in Secondary Schools

DR. D. F. MILLER
The Ohio State University, Columbus, Ohio

During the winter of 1939–1940 the Committee on the Teaching of Biological Sciences of the Union of American Biological Societies prepared a questionnaire for distribution to the teachers of biological sciences in the secondary schools of the United States. Approximately fifteen thousand copies of the questionnaire were mailed to teachers in public, parochial and private schools. The purposes of the committee in sending out the questionnaire may best be expressed by quoting from its introduction.

"Already the above-named committee has promoted the formation (July 1, 1938) of a National Association of Biology Teachers for those who teach in secondary schools; and that Association, with a membership of more than 2,000, has founded a journal—The American Biology Teacher—devoted wholly to you and your efforts to better and strengthen the contribution of biology to the education of 130,000,000 Americans.

"The committee's next and greater efforts must be guided by the quantitatively expressed results of this nation-wide inquiry addressed to you. The information here sought from the biologists' 'front-line'—the individual teachers of biology in our high schools—will show all biologists and many others how they may more helpfully share in the life and education of our people. Your assistance in creating this guiding information is indispensable."

The returns came in slowly over a period of nearly a year. The filing and tabulation of these returns involved an

immense amount of work and time. The committee now wishes to make available to all interested persons as much of this information as possible. Consequently there will be printed in several issues of THE AMERICAN BIOLOGY TEACHER summarizing tabulations and explanations of the various sections of the questionnaire. After these sections have appeared separately in the journal they will be bound together in the form of a pamphlet.

SUMMARY OF THE SECTION ON "POSITION AND EXPERIENCE"

The part of the questionnaire appearing under this head contained items *one* to *eleven* inclusive. Each of these will be taken up separately under its appropriate number.

ITEM 1. "I am a —man; —woman; teaching in the state of ————." The three parts of this item make it possible to classify information obtained for all parts of the questionnaire according to men teachers, women teachers, and the states and regions of the United States. Thus the chief value of the item lies in its use with the other information. In this respect it is much like item 9 which will be considered next. Table 1 contains the results for item 1 as well as item 9.

ITEM 9. "My present school is a (check)—public school; —parochial school; —private school." This item was designed to make it possible to separate the information under the types of schools. The results of these two items may be summarized in the following table.

TABLE 1

Replies	Public	Parochial	Private	Totals
Men	1992	32	91	2115
Women	890	64	91	1045
Totals	2882	96	182	3160

The total number of questionnaires returned and used in the summary, however, was 3186. This discrepancy is explained by the fact that some failed to indicate sex while some were checked as both (possibly where two teachers filled out a joint return). The smallest number of returns from any state was three and the greatest number of returns from any state was 318, but there were some returns from each of the 48 states and from the District of Columbia. The *number* of returns from any one state does not indicate the *percentage* of questionnaires returned since the number sent to each state is not known. (This information was not available to the committee.) The fact that twice as many men as women returned questionnaires is without significance since the proportion in which they were sent out to men and women is not known.

ITEM 2. "I am now teaching (biological subjects).

Subject	Clock hrs. per wk.	Av. hrs. lab. per wk.	Grade level
Biology			
Botany			
Zoology			
Physiology			
General Science			
Hygiene			"

The replies to item 2 show several points of interest concerning the biological subjects taught in secondary schools. The sample table given here is made for eleven scattered states and is definitely representative of the entire United States. To include all data on such points would necessitate more space for tabulation than would be warranted in an abbreviated summary of this kind. It indicates that of all subjects biological the one most frequently taught along with biology is general science. This may be due largely to the relatively

small number of other biological courses offered in the secondary schools and relatively large amount of general science. It must not be concluded from these figures, however, that general science is the subject most frequently taught by biology teachers since the analysis of item 6, Table 3, which follows this shows eleven subjects ahead of general science. But it may be reasonably assumed that the number of cases of teachers who teach both general science and biology is reduced because general science is usually taught as a junior high school subject and biology as a senior high school subject. Where the school system separates these two high schools, the teaching of both subjects by the same teacher would become impossible.

subjects were mentioned but once or twice and all such have been eliminated in summarizing the data into tabular form. If we take only such subjects as were mentioned 50 or more times there are still 13 different subjects. Table 3 shows these 13 subjects and the frequency with which they are taught by biology teachers. Since the data on this item have a direct bearing upon broad problems such as teacher training and employment the tabulation for all states is included in the table.

The wide distribution of these replies would seem to indicate that it is a fair and reliable indication of the conditions in all parts of the United States. It definitely shows that biology teachers in general teach the other sciences much

TABLE 2

Item 2, Part 1. Relative frequency of various biological subjects taught by teachers in public schools of 11 states

States	Number of replies	Number teaching various biological subjects*					
		Biol.	Bot.	Zool.	Physiol.	Gen. Sci.	Hygiene
Alabama	47	43	....	....	1	29	8
California	162	140	16	3	23	55	6
Florida	18	17	....	1	2	4	2
Georgia	11	9	3	2	....	6	....
Idaho	22	21	2	3	1	10	2
Indiana	127	117	11	4	8	35	31
Louisiana	11	11	....	....	....	6	....
Massachusetts	82	78	2	1	6	13	7
New Jersey	78	74	....	3	4	18	4
Ohio	214	201	5	8	....	88	4
Oregon	33	31	3	....	2	11	5
Total	805	742	42	25	47	275	69

* There were a few scattered additional subjects from California and Ohio.

ITEM 6. "In addition I teach ——— (— hrs. per wk.)". Because of its close relationship to item 2, item 6 should be considered at this point. Replies to this query totaled 1885 and represented all states and the District of Columbia. It is well-nigh unbelievable to find that there were 95 additional subjects taught by biology teachers. Some of these were no doubt duplicates given under different names. However, many of these

more frequently than they teach the non-science subjects. Of the non-sciences, English and history rank much higher in frequency than others. As was mentioned previously under item 2 this table shows that general science is not taught as an additional subject as frequently as are a number of other subjects. It ranks twelfth.

ITEM 3. "I am the only teacher of the above subjects (item 2) in our school

—; there are — additional teachers." To this, as to all other items of the questionnaire, everyone did not give a reply. A total of 207 questionnaires failed to report on this item. We must also suppose that from some schools having more

TABLE 3

Item 6. Summary of data showing frequency with which teachers of biology teach other subjects. (Subjects mentioned less than 50 times are omitted.)

States	Number of of replies	Chemistry	Mathematics	Physics	Phys. Edu.	History	English	Agriculture	Geography	Athletics	Social Sci.	Com. Subjects	General Sci.	Senior Sci.
Alabama	34	18	9	11	2	3	2	0	1	1	1	0	0	0
Arizona	7	0	2	4	0	1	0	0	0	1	0	0	0	2
Arkansas	6	2	3	1	0	0	1	0	0	0	2	0	0	0
California	93	29	24	18	14	4	2	3	1	3	3	3	1	6
Colorado	17	7	4	5	1	0	2	0	0	0	1	2	0	0
Connecticut	11	5	1	5	0	1	3	0	1	0	0	0	1	0
Delaware	3	1	0	3	0	0	0	0	0	0	0	0	0	0
Florida	14	5	3	3	0	1	1	0	0	0	0	1	0	0
Georgia	7	1	1	1	0	0	1	0	0	0	0	0	0	0
Idaho	18	5	6	2	3	1	1	3	0	3	1	2	0	0
Illinois	159	21	29	35	24	18	17	14	4	10	3	4	4	1
Indiana	85	17	21	17	9	4	5	20	4	1	0	1	1	0
Iowa	50	3	11	16	4	6	6	4	2	1	3	4	2	0
Kansas	63	9	19	17	3	4	4	8	1	10	4	2	0	0
Kentucky	25	11	7	4	3	0	1	0	4	0	2	2	0	0
Louisiana	7	4	2	2	1	1	1	1	0	0	0	0	0	0
Maine	13	3	8	0	0	4	1	0	0	0	2	1	0	0
Massachusetts	51	16	8	10	2	4	5	0	3	0	2	1	2	2
Maryland	20	11	7	5	0	1	0	7	0	0	0	1	2	0
Michigan	93	27	22	8	2	7	6	34	4	1	3	4	1	2
Minnesota	86	33	20	25	13	10	4	2	9	7	5	6	3	4
Mississippi	10	4	3	3	0	0	0	0	3	0	0	0	0	1
Montana	20	7	11	4	1	0	3	1	0	0	0	0	0	1
Missouri	46	10	14	9	7	1	1	4	2	6	3	0	3	1
Nebraska	43	8	15	16	4	5	5	0	1	2	1	1	1	0
Nevada	2	1	1	1	0	0	0	0	0	0	0	0	0	0
New Hampshire	12	3	4	1	0	2	2	0	1	1	1	0	1	0
New Jersey	28	10	6	5	0	1	0	0	2	0	0	0	0	1
New Mexico	10	3	2	4	0	2	1	0	0	1	0	1	0	0
New York	78	34	11	29	4	2	2	0	2	0	1	0	2	4
No. Carolina	52	15	16	20	3	1	6	0	9	0	2	3	2	1
No. Dakota	23	5	4	2	4	4	4	3	0	3	1	0	1	0
Ohio	128	26	25	23	22	11	9	7	9	9	6	3	8	3
Oklahoma	66	4	26	8	0	8	4	4	5	3	2	3	2	1
Oregon	20	3	4	5	0	4	1	0	1	2	0	2	0	2
Pennsylvania	149	71	23	50	7	10	2	0	5	3	4	2	3	6
Rhode Island	6	3	0	3	0	0	1	0	0	0	0	0	0	0
So. Carolina	6	4	0	2	0	0	0	0	0	0	0	0	1	0
So. Dakota	22	10	8	5	0	1	5	0	0	2	1	1	0	1
Tennessee	20	9	5	0	1	2	1	0	1	0	0	1	1	1
Texas	50	20	17	14	2	6	1	1	1	1	1	0	1	1
Utah	6	0	2	1	1	0	0	1	0	0	1	0	0	1
Vermont	8	2	6	2	0	1	0	0	1	0	2	0	0	0
Virginia	38	12	13	3	3	7	6	0	1	0	3	0	0	0
Washington	43	21	15	10	6	5	1	2	3	4	1	6	1	0
W. Virginia	41	16	6	11	6	3	1	1	3	4	0	0	3	1
Wisconsin	81	21	15	22	3	7	5	1	6	7	2	6	7	6
Wyoming	12	4	2	7	1	0	2	1	0	1	1	2	0	1
Dist. Columbia	2	0	1	0	0	0	0	0	0	0	0	0	0	0
Totals	1885	554	463	452	160	153	133	116	99	88	65	60	56	50

than one teacher of biological subjects more than one questionnaire was returned, thus giving duplications. If we assume, however, the number of omissions about equals the number of duplications we would have reports upon high schools in which approximately one-third of all the teachers of biological subjects in the United States are teaching.

TABLE 4

Teachers reporting and additional teachers of biological subjects

	Public schools	Parochial schools	Private schools	
Total teachers reporting	2900	99	184	
Additional teachers reported	4302	102	96	
Total teachers represented	7202	201	280	
Unclassified reports				3
Grand total				7686

ITEM 4. "Our general science course is — per cent biology." A total of 2353 teachers reported that general science was taught in their school and gave an estimate of the biological subject matter which the course contained. In nearly all parts of the country the amount of biology in general science is estimated as being between 20 per cent and 30 per cent, but there are extremes of 13.9 per cent in rural New England and 42 per cent in large cities of the east. The average of 23.8 per cent for all schools reporting is probably a proportion arrived at for general science courses based upon material departmentalized into chemistry, physics, geography, and astronomy as well as biology. The following summary shows the percentage by types of schools and by types of communities.

Discrepancies in totals are due to the incomplete answers of a number of questionnaires.

ITEM 5. "Our general science is taught predominantly by teachers trained in: —biology; —chemistry; —physics; —geology; or ———— (other subject)." The training of general science teachers in the various fields of science is quite uniform throughout the states. The figures given in table 6 for the entire country are so typical of the various regions that it serves well the purpose of any part of the country. The number of teachers of general science trained predominantly in biology, chemistry and physics is generally large. In no case are "other subjects" given frequently. The majority of states gave biology slightly more frequently than they did chemistry and physics but the differences were never great. This condition should indicate that general science teachers are for the most part prepared predominantly in the fields best to fit them for their teaching.

ITEM 7. "With free choice of subjects I would prefer to teach ————." From this item it was intended to discover what proportion of teachers of biology were teaching biology by prefer-

TABLE 5

	Public schools	Parochial schools	Private schools	Cities over 100,000	Cities between 10,000–100,000	Towns between 2,000–10,000	Rural	United States
Reports received	2184	55	111	352	367	622	854	2353
Per cent of biology in general science	23.7	28.9	24.2	32.3	21.1	21.9	22.3	23.8

TABLE 6

General science teachers prepared predominantly in biology	1528
General science teachers prepared predominantly in chemistry	1417
General science teachers prepared predominantly in physics	1025
All other subjects	478

ence and how many would choose another field if possible. From the standpoint of the field of biology the results showed a gratifying condition to prevail. It indicated that nearly 71 per cent of those reporting preferred to teach the biological science which they were now teaching. This has two associated factors, however. It does not follow that the nearly 19 per cent who preferred some other science nor the nearly 11 per cent who preferred a non-science as first choice were dissatisfied or teaching biology against their will. But on the other hand it must be considered that teachers who were very dissatisfied or disinterested in the teaching of biology most probably did not bother to fill out and return a questionnaire.

TABLE 7

Biology teachers who preferred to teach biology	1952
Biology teachers who preferred to teach another science	517
Biology teachers who preferred to teach a non-science	295
Total reporting	2764

ITEM 8. "Previous to this year (1939–1940) I have taught:

—general biology —yrs.
—botany —yrs.
—zoology —yrs.
—physics —yrs.
—physiology —yrs.
—general science —yrs.
—hygiene —yrs.
—chemistry —yrs."

While the reports returned show that the previous teaching experience of biology teachers was distributed among all of the usual high school sciences the only ones mentioned with sufficient frequency to be of any significance were chemistry, general science and physics. This coincides with the results of item 7 on the choice of teaching fields and with items 19 and 20 on training.

The number of years of experience in the teaching of these subjects shows that, in general, experience in the teaching of biology was somewhat greater than the experience in the teaching of other subjects. It further shows that the number of years of previous experience varies directly with the size of the school community, being longest in cities and shortest in towns and rural communities.

ITEM 11. "I am a member of the following Teachers' Associations, Scientific Societies or Educational Organizations."

The table on membership in societies shows that secondary school teachers of science in all states are organized into educational associations. The average number of such memberships for the United States is 1.8, indicating that most biology teachers belong to two such organizations.

Membership in scientific societies, however, is more variable and in general much lower, showing about one such membership for each two biology teachers. Since most scientific societies have original research as their primary aim it is to be expected that secondary school teachers should hold relatively few memberships in them.

It will be of interest to members of *The National Association of Biology Teachers* to know that slightly more than one out of every five teachers (21 per cent) who reported on this item were members of their organization.

Summaries of other parts of this questionnaire will appear in other issues of THE AMERICAN BIOLOGY TEACHER.

TABLE 8

Memberships per teacher held by public school teachers in professional organizations

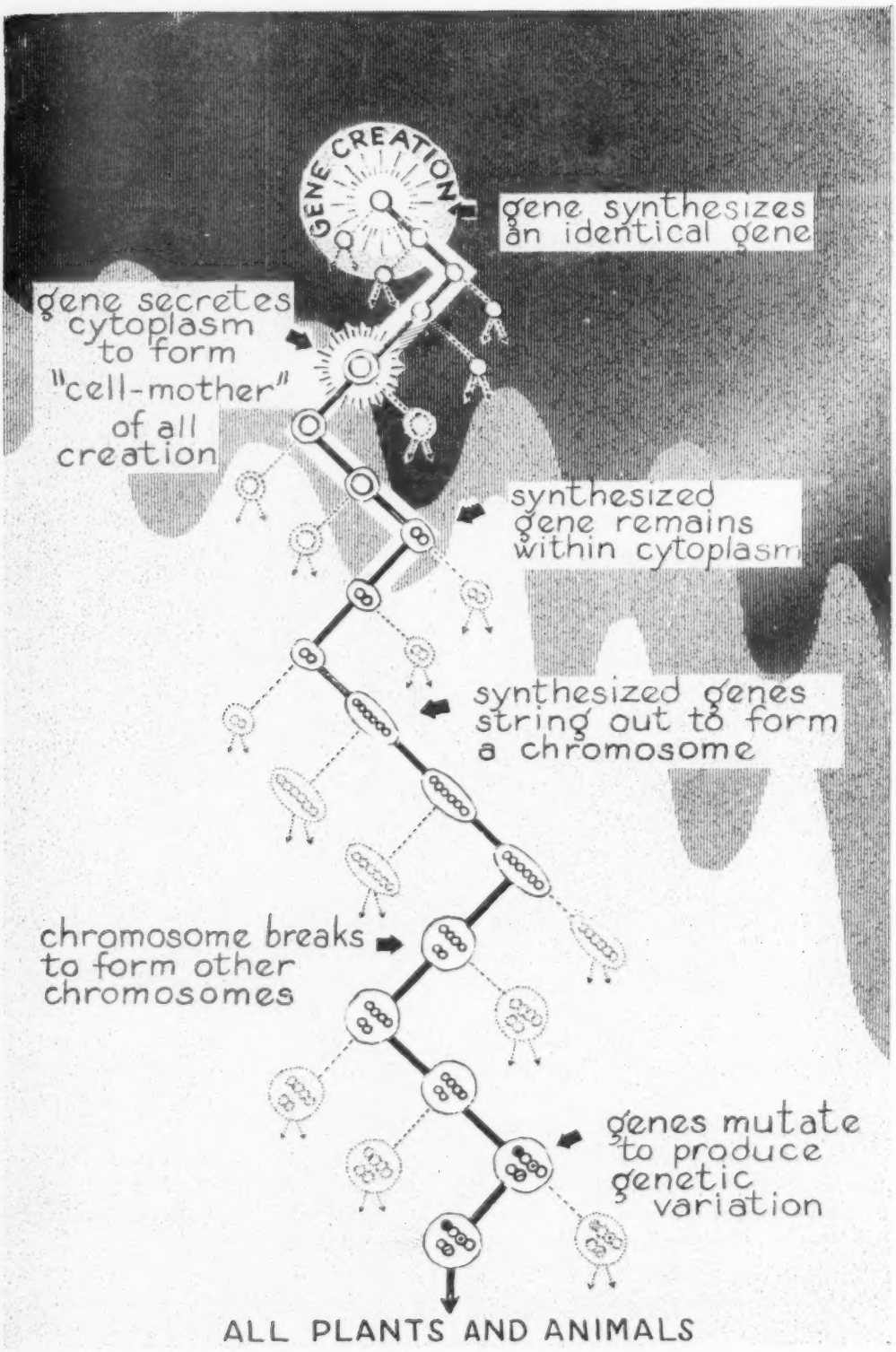
States	Number of Replies	Avg. No. of Memberships: Educational Societies	Avg. No. of Memberships: Scientific Societies	Number of Members of N. A. E. T.	States	Number of Replies	Avg. No. of Memberships: Educational Societies	Avg. No. of Memberships: Scientific Societies	Number of Members of N. A. E. T.
Alabama	47	1.5	.23	2	New Hampshire	16	1.6	.32	8
Arizona	7	1.6	.29	0	New Jersey	75	2.2	.86	14
Arkansas	9	1.3	.11	1	New Mexico	10	1.7	.30	1
California	151	1.9	.50	40	New York	201	1.6	1.38	61
Colorado	29	2.4	.31	1	No. Carolina	61	1.3	.13	4
Connecticut	26	1.8	.65	13	No. Dakota	23	1.6	.00	1
Delaware	2	3.0	.00	0	Ohio	211	2.4	.46	55
Florida	17	1.4	.29	1	Oklahoma	80	1.6	.46	4
Georgia	11	1.9	.55	2	Oregon	31	2.1	.06	10
Idaho	21	1.5	.00	1	Pennsylvania	217	1.7	.84	40
Illinois	270	1.9	.77	95	Rhode Island	7	1.9	.14	1
Indiana	121	1.7	.87	30	So. Carolina	61	1.3	.13	4
Iowa	65	1.3	.68	5	So. Dakota	24	1.6	.00	1
Kansas	80	1.7	.49	17	Tennessee	25	2.3	.36	1
Kentucky	26	2.3	.35	4	Texas	69	1.5	.23	8
Louisiana	10	1.7	.60	1	Utah	8	2.1	.75	1
Maine	13	2.8	.61	2	Vermont	7	1.9	.00	1
Massachusetts	76	1.6	.70	40	Virginia	49	1.7	.29	11
Maryland	23	2.0	.34	7	Washington	56	1.5	.23	9
Michigan	132	1.9	.45	23	W. Virginia	59	1.7	.61	10
Minnesota	99	1.5	.37	11	Wisconsin	114	2.2	.11	24
Mississippi	11	1.5	.00	1	Wyoming	11	1.7	.09	1
Missouri	72	1.9	.40	13	Dist. of Columbia	15	1.9	.67	12
Montana	23	1.5	.13	7					
Nebraska	50	1.5	.14	0	Total U. S.	2772	1.8	.55	596
Nevada	2	2.0	.00	0					

Progressive Diagrams for Teaching Biology

DR. CLYDE E. KEELER
The Wistar Institute, Philadelphia

Every teacher knows that most of his students have visual memories. Consequently, a secret of good teaching is to devise and present in as interesting a fashion as possible striking chronological pictures or progressive diagrams that the students cannot forget. These become memory outlines about which the student may cluster and affix all other relative facts.

For example, if one is presenting the subject of Evolution it is difficult to get across in logical order the earliest events inferred from recent cyto-genetic discoveries. So we make a progressive diagram for lantern slide use. See figure 1. The zig-zag path of descent represents its random nature. We illu-


GENE CREATION
gene synthesizes an identical gene
gene secretes cytoplasm to form "cell-mother" of all creation
synthesized gene remains within cytoplasm
synthesized genes string out to form a chromosome
chromosome breaks to form other chromosomes
genes mutate to produce genetic variation
ALL PLANTS AND ANIMALS

minate this path by darkening and shading the background, thanks to stippled and shaded cellophane. Lines of descent of genes and cells outside the direct path, and hence lost to evolution, merge into this background. Dashes and arrows represent cell divisions. We halo the two events being dramatized in our lecture presentation of which we include here an excerpt on the matter in question:

"Such, we believe, were the law-abiding, established rhythms of our young, inanimate world.

"But could a chemist have examined this sterile world he would have found that where the reactive elements chanced to come together, there, according to ever-present Natural Laws, chemical compounds were being formed, both simple and complex. There were myriads of protein molecules such as the viruses: those ultra-microscopic mysteries that hover between the living and the dead. Among them there occurred elaborate organic structures called genes, and eventually one of these gene molecules appeared that possessed in its chemical configuration the creative genius of synthesizing another gene like itself. One of these genes learned the 'trick' of secreting cytoplasm about it to form a primitive cell.

"We cannot imagine how many legions of such perfect, though primitive, bacteria-like cells capable of cell division, arose, flourished during many generations and then perished when unfavorable conditions arrived, before there was elaborated at last, perhaps, just one heroic cell which eluded the hand of death and crowned itself with the halo of immortality, to become the mother of all living things—including ourselves.

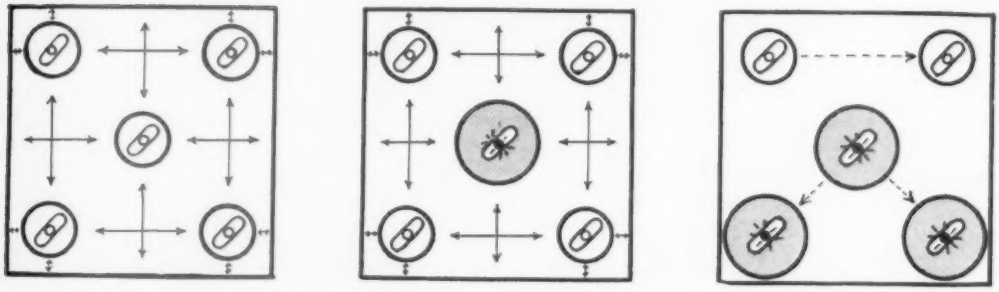
"At length in some of her descendants the primitive genes divided and strung themselves out into chains to form chromosomes. In others, these chains broke to increase the chromosome number. In still other individuals certain genes mutated or altered their chemical constitutions to provide genetic variation. Through the capacity of our pristine ancestor cell to divide, through the propensity of her gene molecules to alter their chemical details, and through the occasional irregularities that took place in chromosome separation during cell division, that silent mother of us all, performed the Miracle of Creation, ordinarily assigned to thunderous deities, and made it the legacy of her children in all generations. As human beings we stand humbled before this miraculous heritage of ours: the ability to create and modify such living organisms as we are."

In a later lecture, after presenting an imposing array of facts in an interesting fashion on Constancy of Inheritance, Mutability of the Genes that introduces Hereditary Diversity, Equilibria in Nature maintained by Population Pressure that provides a Progressive Evolution or a Survival of the Fittest, we conclude with a definition:

"Progressive Change by Natural Selection through the Power of Population Pressure upon the Advantageous Hereditary Variations arising in the germplasm as a result of Gene Mutation: This is Evolution!"

But our definition is of necessity too deep and involved for the students to grasp. It must be learned outside the classroom after its meaning is understood. It needs a progressive diagram. And here is the diagram in figure 2.

The box walls represent the environment. Arrows represent pressures holding the organisms (circles) of any species in natural equilibrium. Within each individual organism is represented a



PROGRESSIVE CHANGE by NATURAL SELECTION through the POWER of POPULATION PRESSURE upon ADVANTAGEOUS HEREDITARY VARIATIONS arising in the germplasm as a result of GENE MUTATION = EVOLUTION.

FIG. 2.

chromosome bearing a gene, to indicate its genetic mechanism.

In the first diagram all is in equilibrium. All organisms are alike. In the second diagram a gene has mutated, or some other genetic change has taken place conferring on a particular individual a physical advantage, such as size, over his fellows. In the third diagram, we see that because of this physical advantage the mutant individual is able to leave relatively more successful descendants than an old style organism.

Suppose that we are terminating our lectures on Evolution. We need a progressive diagram to make the Conquest of the Environment stick. It must be bound up with the Phylogenetic series. It must be dramatic. See figure 3.

We excerpt a portion of our summary here:

"Life multiplied and spread out to populate the adjacent Arctic Ocean with lowly backboneless animals, while primitive one-celled, green-plant types developed that were destined to form the basal food supply of many later marine animals.

"Tropical swamp plants without flowers made up of such forms as primitive giant-ferns, horsetails, club mosses and conebearing trees, invaded the marshes to establish veritable steaming jungles because of their great heat and humidity.

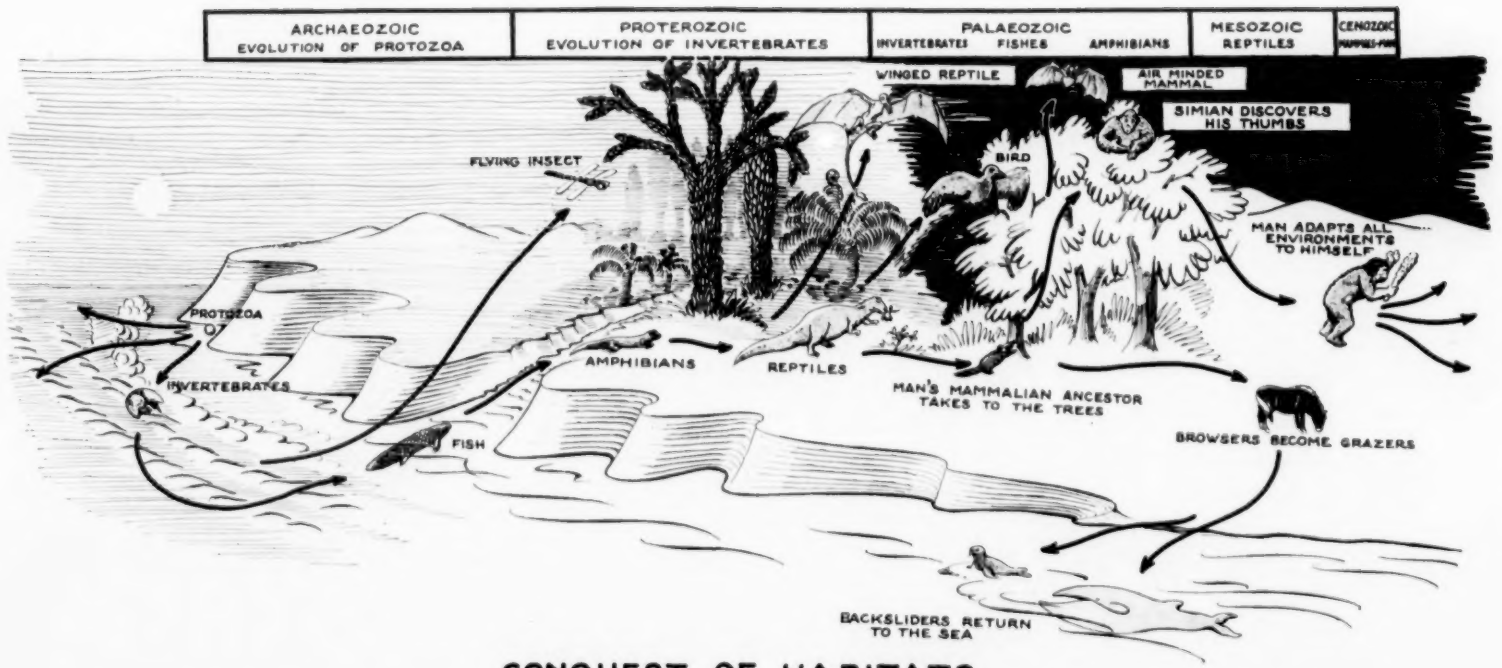
"As the early vertebrated animals arose, like the eels and primitive fish, some of them found the outlets to fresh-water streams and there we may imagine that their efforts to maintain themselves facing against the downstream current may have selected those forms more strong of fin. Life ascended the streams.

"By the seasonal drying up of small fresh-water pools, we may imagine a selection of land-locked fishy types giving rise to air-gulping amphibia.

"From the amphibian group there developed bizarre reptiles of many shapes and sizes, including snorting, giant-dinosaurs that lumbered about the edges of the swamps, dived and swam in the warm inland waters. These reptiles were still better adapted than the amphibians to out-of-water existence.

"The reptilian stock at its primitive base gave rise to small furry mammals.

"As the humidity and temperature



CONQUEST OF HABITATS

FIG. 3. Life appears to have originated in some tidal pool in the then warm Arctic region. Invertebrate life begot fish; fish begot amphibian; amphibian begot reptile; reptile begot bird and mammal, each time as a result of violent environmental changes that rigorously selected the variation that had arisen in living things as a result of gene mutation. Four times life conquered the sky habitat: first as insect, then as pterodactyl, as bird, and as bat before man conquered it, not with his physical body, but with the creations of his superb imagination.

decreased, huge polar ice sheets developed and radiated. With the frigid sword of death these ruthlessly advancing monsters drove all unadaptable forms of Life from their polar Eden. Under the threat of annihilation Life fled southward to take refuge in the several present continents.

"The differences of climate in the new refuges as compared with their old home dictated new barriers and new restrictions on Life. Some forms, both plant and animal, met the challenge of the altered milieu. Others were unable to meet it and therefore suffered extinction. The flowering plants, for example, were more adaptable than the primitive non-flowering types, and huge forests of modern style arose in the new-found havens of Life. Most of the refugee dinosaurs perished by the wayside because they were unable to modify in response to the new environmental demands. The mammals with their furry coats seemed better able to change themselves by natural selection to conform with the new requirements of their surroundings.

"Among others, the mammalian stock ancestral to man, in some primitive form such as the shrew or the opossum, took to the trees of these new forests and there evolved.

"In the trees some of the higher apes became such adept arborialists that they could maintain a balance or hold on by tail, and feet, freeing their hands. With their hands unoccupied they discovered their thumbs. They found that by the use of the thumb opposite to the rest of the hand they could reach out and grasp objects, or bring them closer to their eyes, ears, nose, and mouths for more careful examination. On the basis of this primitive Simian research there came a selection of better minds.

"When the forests died out and gave way to grassy plains, browsers on succulent forest shrubs were selected into grazers. A few mammals returned to the sea and their appendages became modified simultaneously by selection.

"Some of the arbor-dwellers such as the ancestors of man, descended from their rotting tree-abodes in the dwindling forests, but fortunately for them, they had already developed as tools their minds and their thumbs with which, if they were unable to adapt themselves physically to meet all habitat requirements, they could adapt all habitats to meet their own special physical demands. This amounts to the same thing in survival value."

I believe that among the twenty-two hundred members of *The National Association of Biology Teachers*, many have produced striking progressive diagrams of merit. These ought to be shared through publication in THE AMERICAN BIOLOGY TEACHER.

AUDUBON CLUBS

The National Audubon Society sponsors Audubon Junior Clubs in the interest of Conservation. These clubs are intended to supplement school science programs and will add zest to Nature Study. Ten or more children of any age may enroll as a Junior Club, elect officers and plan their own programs, adapting them to their own interests and geographic location. A teacher or other adult serves as an advisor. The National Audubon Society supplies its Junior Members with bird membership buttons, introductory bird study material and through its Junior Paper, suggestions for club activities. Over 6,000,000 children have been enrolled.

Upon receipt of the club's combined dues of ten cents per child per *school year*, every Club Member receives a bird

button and a set of six four-page bird leaflets, each containing a color plate and outline drawing for coloring. Each club receives *News on the Wing*, Junior Club Paper, published four times during the school year. Every club of twenty-five or more members will receive *Audubon Magazine*. Materials are sent in one package to club advisor.

Audubon Junior Clubs are Nature Clubs. Although the approach is through Bird Study, the text of each of the six bird leaflets sent every Junior Member, relates the bird to the plant and animal life in its environment, and thus helps to create a picture of the interdependence of all living things. It also covers the activity of birds throughout the year. The leaflets come in two editions: Junior Style (large type) recommended for grades below the sixth; Senior Style (small type) recommended for grades six and above. All leaflets describe birds common to the geographic location of the club, although not necessarily birds of the city. A special endowment enables the Society to supply this material at far less than the actual cost.

Clubs may be enrolled by letter from the adult advisor with members' combined dues enclosed. Be sure to state how many sets of leaflets are desired in Junior or Senior styles. Send to: National Audubon Society, 1006 Fifth Avenue, New York, N. Y.

NEW HAMPSHIRE ASSOCIATION

The New Hampshire Association of Biology Teachers met on March 15, 1941, at Colby Junior College, New London, N. H. Mr. Guy F. Williams, head of the biology department, extended greetings and the hospitality of Colby Junior College. A fine display of books used in the teaching of biology by both faculty and students was examined.

Mr. Lawrence J. Goldthwait gave a very interesting talk on "Fossil Biology" during which he showed different types of fossils and explained to us the stories hidden in them.

Miss Alice L. Nelson talked on what the high school student should know about blood. She very effectively explained the composition and importance of blood. After these two instructive talks by members of the Colby Junior College Faculty a discussion on problems confronting biology teachers was held in which both Miss Nelson and Mr. Goldthwait and the members participated.

Our next meeting is to be held in conjunction with the National Association of Biology Teachers' meeting at the Biological Institute, Durham, N. H., on June 25, 1941.

Cynthia T. Corson,
Secretary-Treasurer,
Dover High School, Dover, N. H.

PROPOSAL TO AMEND THE CONSTITUTION

On another page in this issue there is printed a list of suggested amendments to the CONSTITUTION AND BY-LAWS of *The National Association of Biology Teachers,* as proposed by one of the local associations, in accordance with the provisions of the original document. (The CONSTITUTION AND BY-LAWS were printed in full in the issue of October, 1938.) The general purpose of the proposed changes is to increase the number of biologists who have an active share in the management of the Association. Written opinions regarding the proposed amendments should be sent to the Secretary-Treasurer.

The "Practical" Test

PHILIP GOLDSTEIN
Walton High School, New York City

I should like to begin with a quotation from an article previously published dealing with another subject in which I stated, "I myself spent 5 years teaching in an annex equipped with only two microscopes. Naturally, it was necessary for me to depend entirely on the demonstration method for microscope work. In spite of the fact that I used any number of devices to try to make the students see those things I wanted them to see, *I never felt confident that what was so clear to me was at all apparent to them.*"[1]

That was putting it mildly. I really felt pretty certain that they saw very little of what the demonstration was supposed to show them. One day, I decided to do what many poor scientists (and some good ones) do when they have an opinion but no objective evidence to support it. I set out to *prove* that students who were subjected to demonstration microscope work really saw little and remembered less.

So without warning, I "sprang" a new kind of test on one class of innocent victims. I set out five microscopes with materials which had been demonstrated at some time during the term. Each microscope had attached to it a paper with two questions pertaining to the material visible. The students were sent up in turn, and they answered the questions in writing while peering through the ocular.

The class as a whole had an open book lesson since only five girls[2] could take the test at once. This left me plenty of time to watch the "victims" at the microscopes. As I watched, I became more and more convinced that my opinion would be supported by the "experiment" which I had set up to prove it.

Then I marked the papers. Since that time, I have a healthier respect for the powers of observation of my students. The results gave me a shock, but they were very gratifying. About 80% of the class got between 8 and 10 on the test. Only two or three girls got less than 6.

The experiment was a total failure in so far as substantiating my preconceived opinion was concerned. But it was a great success in every other respect. It gave me an idea. Since then, I have tried to include with each full-period test a few questions of this type, under the title of the "Practical Part" of the test.[3] I extended the practical part of the test to include materials other than those used with the microscope, and I worked out a fairly adequate technique which runs somewhat as follows—

1. A mimeographed test, calculated to to require 30 minutes of answering time, is prepared.
2. The materials to be used in the "Practical" part of the test are carefully culled from among all the materials which were used during the teaching of

[1] "A Simple Micro-Viewer," Philip Goldstein, *The American Biology Teacher*, Vol. I, No. 6, March, 1939, p. 122. (Italics were not used in the original article.)

[2] Walton High School is an all-girls school.

[3] This name was evolved from the "Practicum," the imposing title bestowed upon a similar (but more elaborate) test given as part of the work in many of my college biology courses.

the topic. Generally five objects were used with two questions on each.

3. Questions based on these materials are prepared and typed out on separate slips. If there are two questions about one object, they are both put on the same slip. Care is taken to word the questions in such a way, that no more than one short sentence need be written to anwer each.

4. On the day of the test, the students are set to work on the mimeographed part of the test, immediately upon their arrival.

5. The materials previously prepared, are set out, each object with its appropriate questions.

6. One student is sent up to the first object. As she answers the questions, and moves to the second object, another girl goes to the first object.

7. As each student completes the "Practical" part of the test, she hands in her answers, and returns to work on her mimeographed test. Thus, each student has approximately 10 minutes to spend on the "Practical" part of the test, and 30 minutes to spend on the written questions.

8. If time permits, when all have completed the practical part of the test, any student may return for a second look at any of the objects.

The following "Practical Test" was actually used in the manner described above, in connection with a test on reproduction. There were two questions on each item.

OBJECT SET UP

A. Microscope with prepared slide of Paramecium in process of dividing.
B. Dissecting microscope with a budding hydra.
C. Male frog dissected to show testes.
D. Two test tubes containing broth, both marked "boiled." One is corked, and the broth is cloudy. Other is sealed by melting the glass, and the broth is clear.
E. Microscope showing spirogyra in conjugation. Pointer in ocular ———— indicates a zygospore.

QUESTIONS ASKED

A. The organism under the microscope is is ————.
   The process of reproduction illustrated is ————.
B. The organism under the microscope is ————.
   The process of reproduction illustrated is ————.
C. Is this a male or female frog?
   How do you know?
D. Name a scientist who did an experiment similar to this one.
   What conclusion do you draw from this experiment.
E. The process of reproduction illustrated is called ————.
   The structure indicated by the pointer is

In this particular test, a bottleneck developed at questions 6 and 8 since each required a sentence as an answer, whereas none of the other questions required more than a single word. In subsequent tests I found it advisable to avoid this. When it was impossible to have all the answers run about the same in length, a somewhat different arrangement or spacing of the objects was indicated. Thus, if I were repeating the test just described, I would arrange an extra space after C, and another after D, so that when the first girl is ready to answer question 6, she can move over to the space provided for the writing, making room at object C for the next girl.

Other members of our biology department have adopted the idea of "The Practical Test" for use in their own classes. This term it was made departmental policy in at least one grade of work. Part of the work of Biology III, deals with the "roll call of the plant and animal kingdoms." When this topic was completed, a full period was devoted to a "Practical Test" covering the subject matter. This test was more or less uniform for all classes.

Furthermore, in two grades of biology (special courses for low I.Q. students with low reading and vocabulary levels), a 40 minute "Practical Test" was incorporated as part of the midterm

examination. When the entire period is to be used for this form of test, the procedure is somewhat altered. Care is taken to provide at least as many objects as there are students in the class. Each student begins at a certain object, and proceeds to every other object in turn, until she returns to the one from which she started. To avoid confusion, every girl moves at the same time, on a signal given by the teacher.

Certainly a test of this type means work. It requires work on the part of the teacher who must spend hours planning the questions. It requires work on the part of the laboratory assistant who must dig out set-ups which were used weeks before, or perhaps even set them up again. It means work on the part of the head of the department who must arrange for special shifting of classes so that the test may be set up in the room best suited for the purpose. Is it worth all this effort?

Personally, I like this type of test, and before concluding, I should like to point out why.

1. *The students like this form of test.* It is different from the regular run of tests.

2. *The test is really diagnostic.* It can show the teacher where reteaching is needed.

3. *The test is really a teaching device.* Pupils frequently ask questions concerning an object after the test, whereas they failed to ask when the same object was presented as part of the class work.

4. *The test really measures how consistently a student has done his work.* It is next to impossible to "cram" for a test of this sort. A student who has conscientiously and carefully considered all the materials presented to the class, will have no difficulty with such a test. A student, no matter how bright, who has been negligent with the expectation of reading his textbook just before the exam, will not do well.

5. *This type of test presents a means of measuring the biological knowledge of girls and boys who have difficulty in understanding written questions.* Students who read poorly, frequently fail on tests as a result of lack of comprehension, rather than lack of knowledge. (To illustrate, take the case of a girl in the special low I.Q. group previously mentioned. Her oral answers in class are generally satisfactory if the question is made clear, yet she has never gotten more than 45% on any of the four written tests she had so far during the term. On the "Practical Test" which was part of the mid-term examination, her score was 32 correct out of 40.)

6. *This type of test may, in its highest form, measure objectively the student's ability to observe, his reasoning power, and his understanding of scientific method, far more adequately than any written test.*

In conclusion, I should like to ask the reader not to pass judgment upon this type of test without trying it once or twice. The idea is not new. It has been used in the colleges for a long time. We in the high schools have not taken advantage of the opportunities it presents.

THE USE OF LABELLED DRAWINGS IN THE TEACHING OF COMPARATIVE ANATOMY

It is high time that teachers of comparative anatomy and similar courses decide just what it is that they are trying to teach—art or anatomical detail and relationship. It seems to me that under the observe-and-draw method far too much time is spent in completing a presentable drawing and far too little is

spent in observation—the most pressing need, as far as the student is concerned, being to prepare a drawing, by some hook or crook, that will pass the instructor's inspection and parenthetically I may remark that the greater the number of students (and consequently drawings) per instructor the less likely is his inspection to be continuously rigid. Under such a procedure it is usually the practice to limit or prohibit the use of labelled illustrations during the laboratory period (for fear the student will copy them). The assumption seems to be that by following written or oral instructions the student will be able to make the dissections, recognize the features, and, by preparing a sketch of them, fix them in mind. Any experienced teacher knows that these assumptions are largely false. The fact is that the average student must be shown many of the structures by an instructor or the instructor's agent (in the form of labelled diagrams); and it is equally true that the preparation of sketches is not necessary to fix anatomical details in mind, as any teacher or student of medical anatomy well knows.

Apparently then the only real purpose served by the preparation of formal drawings is to furnish incentive for the student to make the observations and to guarantee that he has done so—and at what a cost in students' and instructor's time! An equally effective incentive is to be supplied by rigid oral quizzes over the students' own dissections and I submit that such a practice eliminates the chance to copy or to substitute anything for actual observation, and time otherwise used for preparation of drawings is available for dissection and study. From experience I know that the effort induced by the prospect of an oral quiz is normally sufficient to fix the material in mind. Further, with the temptation to copy printed drawings removed the student is free to use labelled illustrations as aids in recognizing structural details and relationships.

Richard R. Stuart,
Professor of Biology,
State Teachers College,
Wayne, Nebraska.

Biological Briefs

Murphy, Robert Cushman. *Conservation's Silver Lining.* Natural History 46: 294–303. December, 1940.

The past history of the Peruvian guano industry has been one of discovery, exploitation, and ruin. The conversion of this situation into the status of a true and lasting industry is one of the greatest examples of practical conservation now known.

The biological background involves the interaction of the sun's heat and the winds to determine the course of the cold Humboldt current, normally carrying a rich marine flora and fauna northward along the Peruvian coast. At such times, the abundance of bird life increases enormously, and heavy layers of guano accumulate on a series of coastal islands. A rainless climate permits the guano to maintain its fertilizing efficiency by sealing in the organic compounds otherwise lost by leaching and evaporation. Occasionally, however, a warm surface current moving southward replaces the Humboldt current; then conditions for life become unfavorable, and fishes and birds die in myriad numbers. This cycle occurs about once each seven years.

Between 1840 and 1900, the birds were considered a nuisance to the miners working the seemingly inexhaustible supply of guano, and many species could lay no eggs because of extensive mining. Then the deposits were depleted, and

Peru has had to work out a plan of conservation whereby the crop removed in any one season is not allowed to exceed the amount deposited. The operations are attuned to the seven-year cycle, and the guano islands are now sanctuaries.

BARTON, LELA V. *Germination of Seeds.* Scientific Monthly 51: 542–544. December, 1940.

The dormant embryo presents a problem to the seed tester and to anyone attempting to grow plants under controlled conditions. Such seeds must be pre-treated to hasten germination, the type of treatment being determined by the natural conditions which end such dormant periods. Some seeds germinate only at fairly low temperatures; these can be pre-treated on a moist medium for one to three weeks at 50–59° F. before planting. Other types require a period of increased exposure to light. Especially resistant seed-coats prevent the penetration of moisture and thus cause a long period of dormancy in some species. Such seeds must be subjected to baths in hot water or sulfuric acid, or must be run through abrading machines. A "stratification" treatment has been devised for hastening the germination of dormant seeds not amenable to other types of treatment; the seeds are placed in a moist medium under a controlled series of temperatures—33°, 41°, 50° F., for periods of one to several months.

HIRES, CLARA S. *Growing Ferns from Spores on Sterile Nutrient Media.* Journal of the New York Botanical Garden 41: 257–266. November, 1940.

Ideal conditions for the germination of fern spores are difficult to provide. Both nutrition and light are important. The author is successfully obtaining prothallia from spores grown in glass flasks on sterilized nutrient agar. The spores are first freed from micro-organisms by shaking them in a calcium chloride solution. Light in increasing quantities is allowed to reach the small plants as they begin to grow; direct sunlight, however, is never admitted because of the harmful effect of heat rays.

POUGH, RICHARD H. *Massacred for Millinery.* National Audubon Society Circular No. 45. Reprinted from Bird-Lore, September–October, 1940.

Thirty years ago the force of public opinion put an end to the mass slaughter of native North American birds for their plumage. Today we are prone to assume that the problem no longer exists. In New York today, however, the feathers of more than forty species of wild birds may be bought. These include such American species as the condor, golden eagle, bald eagle, whistling swan, osprey, and great blue heron; while the list of foreign species is even more extensive and in greater abundance. The condition results from several loopholes in our existing laws. Many are certified as having been imported prior to 1913, while others are supposedly taken from domesticated species; these are both unlikely in the vast majority of feathers now on hand. Feathers may also be imported for tying flies on fishhooks, but such importations have taken a tremendous leap upward within the last three years, corresponding to an increase in the popularity of feathered millinery but not to any sudden widespread increase in fishing. We must again rally forces to tighten existing legislation and turn public opinion against the use of plumage on millinery.

RUTH SHERMAN.

PROPOSED AMENDMENTS TO THE CONSTITUTION AND BY-LAWS OF THE NATIONAL ASSOCIATION OF BIOLOGY TEACHERS

(Submitted by the *Chicago Biology Round Table*, March 14, 1941, in accordance with the CONSTITUTION, ARTICLE VI and the BY-LAWS, Article IX, for action by the executive board.)

1. The title of ARTICLE IV of the CONSTITUTION shall be amended to read: "Officers and Governing Boards."

2. SECTION 1 of ARTICLE IV of the CONSTITUTION shall be amended by inserting at the head of the list of officers: "the immediate past-president."

3. SECTION I of ARTICLE I of the BY-LAWS shall be deleted from the BY-LAWS and added to the CONSTITUTION as ARTICLE IV, SECTION 2.

4. To ARTICLE IV of the CONSTITUTION add the following: "SECTION 3. There shall be a Representative Assembly, which shall consist of the officers of the Association, members of the editorial board, members of the advisory board, all past-presidents, delegates from each affiliated local, and chairmen of all standing committees. The Representative Assembly shall be the official governing body of the Association and shall convene at the time specified for the business meetings of the Association."

5. Delete SECTION 2 of ARTICLE IV of the CONSTITUTION and add the following section: "SECTION 4. The executive board shall consist of the immediate past-president, president, president-elect, first vice-president, second vice-president, secretary-treasurer, editor-in-chief of the journal, and the managing editor of the journal. The duties of the executive board shall be to regulate the Association on emergency matters demanding immediate attention which cannot be postponed until the next meeting of the Representative Assembly."

6. Amend ARTICLE V of the CONSTITUTION, entitled MEETINGS, to read:

"ARTICLE V—MEETINGS

"SECTION 1. There shall be an annual meeting of the Association. Additional national or regional membership meeting may be called by a five-eighths (5/8) majority vote of all members of the executive board or Representative Assembly.

"SECTION 2. The annual meeting of the Association shall be held in conjunction with the winter meeting of THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. However, the time and place of a subsequent meeting may be changed by a majority vote of the Representative Assembly. The exact time and length of this meeting shall be determined by the president and announced in the October issue of the journal prior to the meeting. One or more of the sessions of the annual meeting must be devoted to the business of the Association by the Representative Assembly."

SECTIONS 2, 3, 4, 5 of ARTICLE I of the BY-LAWS shall become SECTIONS 1, 2, 3, 4, respectively, and in the same order.

7. Delete from new SECTION 1 of ARTICLE I of the BY-LAWS the words: "executive board." Add at this point: "Representative Assembly and have charge of the regulation of the action of the executive board."

8. Add to the wording of new SECTION 1 of ARTICLE I of the BY-LAWS. "He shall prepare and submit to the members of the Representative Assembly prior to the annual meeting an agenda of the business to be considered at the annual business meeting. He shall determine the exact dates of the annual meeting. He shall also announce the time for each of the general and business sessions of the annual meeting in an early fall issue of the journal.

He shall appoint a committee on local arrangements for the annual meeting."

9. Add to the wording of SECTION 2 of ARTICLE I of the BY-LAWS the following: "The president-elect shall be responsible for preparing the program of the general meeting to be held at the annual meeting. He shall attempt to complete the program in sufficient time so that it may be published in an issue of the journal prior to the meeting. He shall work with the committee on local arrangements. He shall work under the direction of the president, making frequent reports of the progress of the program."

10. Change the wording of the BY-LAWS at the points specified below in this paragraph to read "Representative Assembly" in place of "executive board":

NEW SECTION 4 of ARTICLE I; SECTION 1 of ARTICLE II; SECTION 3 of ARTICLE II; ARTICLE III; ARTICLE VI of BY-LAWS in one place in SECTION 1 and once in SECTION 2 of the same article; twice in SECTION 1 of ARTICLE VII; twice in SECTION 2 of ARTICLE VII; twice in SECTION 3 of ARTICLE VII; once in SECTION 4 of ARTICLE VII; once in ARTICLE VIII.

11. Modify ARTICLE IX on *Amendments to the By-Laws* to read the same as ARTICLE VI of the CONSTITUTION as it is amended herein.

12. Delete from the CONSTITUTION in SECTION 1, ARTICLE VI, the words: "executive board," mentioned twice, and add "Representative Assembly," in both places; delete the wording "four-fifths (4/5)" and add in its place "two-thirds (2/3) of the members present and voting." From SECTION 2, ARTICLE VI, delete the words "executive board," mentioned twice, and add "Representative Assembly," in both places.

BOOKS

HUNTER, GEORGE W. *Problems in Biology.* American Book Company, New York. 706 pp. 1935. $1.88.

Mechanical Make-up: The publishers, long a tradition in the publication of biology texts, have in this volume one of the sturdiest bulwarks in the field. It is a durably bound dark green $5\frac{1}{2} \times 8$ inch text with a mildly satisfactory typography, but lacking distinction in composition and layout. Most of the halftones and line cuts are uninteresting black and whites, well-labeled. When colored illustrations are used, and there are several of these, vibrancy and movement are added to the pages. Toward the middle of the book the graph, line cut, and chart are emphasized. There are a number of rotogravure-like pictures.

Psychological Soundness: In an age where youth is very conscious of the fact that during the growth period man can do much to become (physically) the type of individual he wishes to become, it is stimulating to find a text loaded with guiding material.

Care must be taken in presenting the subject matter to a student at the secondary school level so that the student's "apperceptive mass" will make it possible for him to grasp the meaning. Caution is necessary so that an adult conception is not foisted on the pupil. High school students interested in athletics will find an appeal in the colorful picture of the athletes on the football field on page 312. They would eagerly scan the survey questions and be delighted to discover reasons for training,

but might not take seriously the caution to "notice the different ways in which athletes use their muscles."

The general use of the preview is sound psychologically, indicating to the student definite goals and making him feel the need for the material. On page 519 the "dollar and cents" way, indicating a reason for controlling the environment, is practical and understandable. This over-simplification of problems presents a moot question. Should we not encourage independent thinking on the part of all students?

Teacher helps are numerous and extremely valuable. There are in addition to the self testing exercise, practical problems, testing of fundamental concepts, laboratory procedures and exercises, review summaries, and bibliographies. Most references listed have been published prior to 1933. There is one for 1935, and a few for 1934. No guide or work books were submitted.

Subject Matter: After an introductory unit stressing interrelationship the text covers the following general topics: the green plant, interrelationship of all living things, man, interrelationships of man, and other living things. A discussion of heredity, eugenics, euthenics, and plant and animal breeding is developed within 28 pages. The scientists are grouped in one chapter. They might have been presented as their contributions are mentioned.

There is a chapter of seventeen pages entitled "Why and How We Study Biology." This part of the book has invaluable suggestions for preparing for field trips, arranging an ant's nest, making an insect cage, and keeping a balanced aquarium. The author lists the main reasons for studying Biology; among them are its relation to health, economic values, necessity of conservation of natural resources, vocational knowledge, and use of leisure time.

Pictorial methods of classification (covering 58 pages) shows a typical example of the *class* in the center of the page with the *orders* radiating out from the middle of the page. Tropisms, and their effect on several organisms, are adequately discussed. Fundamentals of Ecology are shown by examples, followed by brief statements concerning life zones and distributions of organisms. These subjects form a very interesting and unusual chapter. Physiology of the human race is well covered by 142 pages. Such goals give a purpose to the material and provide an activity which is far-reaching.

The text is particularly forceful in challenging the imagination so that among the membership of a class, some are anxious to visit vacant lots, streams, ponds, and woods resulting in a laboratory full of living material representing plant and animal life; others enjoy making homes for these organisms and still others want to feed and mother them. An insect cage, directions for the making of which are found on page 10; the practical problem of finding what insects are abundant in a locality, listed on page 99, are typical examples of this type of activity. The material is presented in some 20 units arranged in problem form. A very markedly successful effort is made to provide practice in scientific thinking.

Learning Exercises and Teacher Aids: This subject is a rather difficult one to discuss, for the standards accepted for this column are those established by Dr. Hunter himself. However, a careful examination shows some features which might be improved upon.

The efficient means of presenting many self-tests at frequent intervals is most commendable as it aids the student to develop the theme of the section studied rather than trying to include in one self-test many understandings. The continuance of this self-test to unit summaries seems a bit disadvantageous, for the student soon acquires the "thumbing-through-the-test" method of study. The achievement tests at the end of the units are among the best in print, as they force the student to make use of his new material in a comprehensive manner.

A feature of the text that might be given more analysis is the form of presentation of problems and demonstrations. The student is not permitted to guess at the conclusion to be desired. This appears to be a time-saving feature for both the student and the teacher, but one which should not be encouraged. This is followed by 60 pages concerned with ways of controlling and preventing disease. These two sections appear to be the most outstanding part of the text.

Literary Style: Pedagogically "Problems in Biology" is sound. The text is divided into work units. Each unit is introduced by questions to discover what the students already know. A preview follows, giving an introduction, and motivating the topic. Next the problems are started and the means of solving the problems are presented. At the end of each problem there is a self-testing exercise.

New terms are italicized and defined as they arise. There is a glossary at the back of the book.

The style of the book is not easy. There might be more of the warmth and adventure of biology which the text suggests. There is a tendency to depend upon the inherent interest of the subject, to hold the reader. It can be said that no difficulty in entrance of terms is presented.

Alan A. Nathans (Chairman)
Martin Weiss (New York)
Millard Bosworth (Vermont)
Douglas Salisbury (Illinois)
Anne L. Bigler (California)

Laton, Anita D. and Bailey, Edna W. *Suggestions for Teaching Selected Material from the Field of Sex Responsiveness, Mating and Reproduction.* Bureau of Publications, Teachers College, Columbia University, New York. XV + 118 pp. 1940. $1.35 cloth; $.75 paper.

A clear and well phrased work on sex education for schools, contains most helpful sections on situations found in various student groups, training for teachers and specific examples of teaching procedures.

In keeping with its source it contains rather clear discussions of the more learned phases of evaluation, outcomes and educational significance.

The approach is scientific and many modern viewpoints are presented. Any teacher or administrator planning or engaged in a sex education program will be aided by this work but will need to adapt its suggestions and implications to suit the community pattern of which his school is a part. This would be particularly true for teachers in rural and conservative communities.

The annotated bibliography contains seventy-one titles and sources. There are some notable omissions of widely used source materials in this field. One title recommended for every teacher and perhaps every student has been withdrawn from publication because of widespread objection.

P. K. Houdek

HAMILTON, W. J. JR. *American Mammals: Their Lives, Habits, and Economic Relations.* McGraw-Hill, New York. XII + 434 pp. 1939. $3.75.

The author of "*American Mammals*" set for himself a tremendous task when he undertook to cover in one volume the entire field of Mammalogy. The history, reproduction, classification, food getting and other kindred topics all in one volume.

Strange as it may seem Hamilton in "American Mammals" has combined all of the relevant materials on American Mammals into one volume of 434 pages of easily readable print.

He has used a simple and direct language which will interest the laymen and specialized scientific workers. The chapter on classification is brief and concise yet an adequate description of families is included with helpful drawings. Obviously more extensive treatment of families is considered under subject matter headings such as "Characters of Mammals and Other Uses," "Adaptations," and "Food."

Chapters on food and food storage add much new material to the literature on Mammals. Chapters on hibernation, migration and populations are of special interest to ecologists, game managers, and technicians as well as the general biologist and nature study groups. Each chapter has been written with the idea of sifting the available material and presenting the usable information. Complete annotated bibliographies at the end of each chapter add to the value of the book.

The last five chapters are of special interest to isolated workers and specialists in various fields. Every technician in game management should see the chapters on "Useful Mammals," "Injurious Mammals," "Game Mammals," "Fur Bearing Mammals," and "Predatory Mammals." Every citizen interested in the control of mammal groups should see this chapter.

The book is written in readily readable print and contains a very efficient index with valuable author citations. The ancestry of mammals is briefly discussed and drawings have been used freely to give clarity to the print.

WILLIS W. COLLINS,
Civilian Conservation Corps,
Oklahoma City, Oklahoma

SILVER, FERN. *Foods and Nutrition.* D. Appleton-Century Co., New York. 522 pp. 1941. $1.72.

Superbly designed with the most modern typography and refreshing, moving composition, this book adds to the ever-increasing number of texts specializing in different phases of biology. Only Part One of 149 pages directly concerns the biology teacher. It includes such topics as Food in Relation to Energy and Growth, Minerals in Relation to Body Nutrition, The Vitamins, and Adequate Diets. The remaining portions of the reading matter are devoted to the arts and sciences of the homemaker. There are activities and suggested readings at the end of the chapters. A most distinctive feature of the book is its artistic beauty and stimulating photography. The photographs are sharp and well-composed, and they emanate a feeling of modernity and cheerful health.

ALAN A. NATHANS

GOVERNMENT AIDS FOR TEACHERS: Each month, SCHOOL LIFE, the official journal of the United States Office of Education, publishes a page or two entitled, "New Government Aids for Teachers." All of these pages from September 1937 to June 1940 have now been printed together in a 24-page pamphlet entitled *New Government Aids for*

Teachers—a reprint from SCHOOL LIFE. Copies of this list may be obtained from the United States Office of Education, Washington, D. C. Many of the publications listed are free, others are available at low cost from the United States Government Printing Office.

THE NORTHERN INDIANA BIOLOGY TEACHERS ASSOCIATION met in regular session at Peru High School on February 8, 1941, with Mr. C. M. Oury and Mr. Wm. H. Bittell as hosts.

The meeting was opened with a brief welcome and an introduction of the thirty members and friends present. The following interesting and stimulating program was presented:

Grade Placement of High School Biology. Max McCowan, Hammond.

Specific Training of the High School Biology Teacher. A. B. Krom, Wabash.

How Much Conservation in High School Biology? C. C. Miller, South Bend.

Unity of Content of the High School Biology Course. H. H. Michaud, Ft. Wayne.

Mr. E. O. Hanger, Chairman of the State Curriculum and Licensing Committee was present at the meeting and gave a report on the progress made by his committee.

At the close of the program the following officers were elected:

President, Mr. Arthur L. Smith, Central High School, South Bend.

Secretary-Treasurer, Mr. Terzo P. Amidei, Roosevelt High School, East Chicago.

THE EIGHTH ANNUAL MARYLAND BIOLOGY TEACHERS' CONVENTION will meet at Washington College, Chestertown, Maryland, April 26, 1941.

Registration will take place at 10:00 A.M. in the lobby of Dunning Hall. The program follows:

MORNING SESSION: Presiding, Dr. Julian D. Corrington, Washington College.

Opening Remarks. Dr. Gilbert Wilcox Mead, President Washington College.

The Behavior of Chromosomes Following Breakage and Rearrangement. Dr. H. B. Glass, Goucher College.

Maryland's Forests and Parks. Dr. F. W. Besley, State Forester of Maryland.

Exhibits, Lobby of Dunning Hall.

Luncheon, in James W. Cain Gymnasium.

AFTERNOON SESSION (2:00): Presiding, Mr. Richard W. Hall, Chestertown High School.

Slime Molds. Dr. William G. Camp, Maryland Academy of Sciences.

The Place of Biology in the High School Curriculum. Mr. Earle T. Hawkins, State Supervisor of High Schools in Maryland.

Business Meeting.

The Wasp. Dr. Carl G. Hartman, Carnegie Institution of Washington.

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Fig. 449. Coyote, the prairie wolf of North America

See Essentials of Biology pages 637–666.

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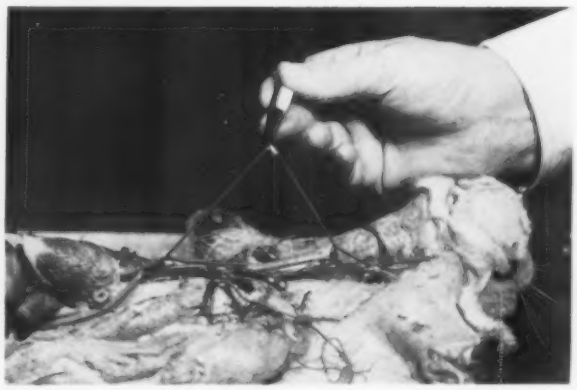

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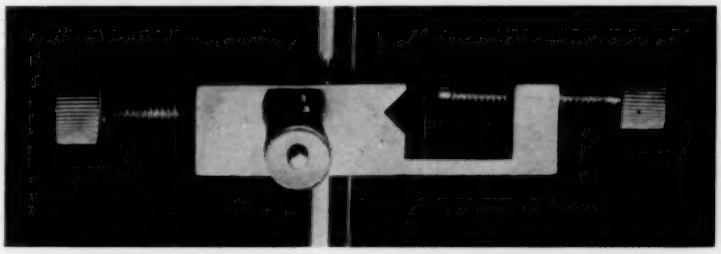

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